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APPLICATION FOR UNITED STATES LETTERS PATENT

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For: FLAT MAIL EDGE BIASING MACHINE AND METHOD OF USE

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FLAT MAIL EDGE BIASING MACHINE AND METHOD OF USE

DESCRIPTION

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention generally relates to a flat mail edge biasing machine and method of use and, more particularly, to a flat mail edge biasing machine used for separating stacks of bulk flats into at least two separate stacks each with bound edges oriented in a same direction.

Background Description

Publishers are used throughout the world for pre-sorting bulk flats (i.e., magazines, newspapers or other items typically less than 1¼ inch in thickness). These publishers typically stack the product (flats) so that they can be provided to a postal facility or other delivery or transportation company for future delivery. However, these products typically have bound edges and non-bound edges, where the bound edges are thicker than the non-bound edges. This difference in thickness may cause a "banana" effect or a tipping of the product when stacked at the publishing facilities.

To ensure that the "banana" effect or tipping does not occur, the publisher will assemble the stacks of their products with the bound edges

rotated every so many pieces in order to maintain a straight stack. By using this procedure, however, a mail sorting facility, whether it be a postal facility or other delivery or transportation facility, must reorient the stacks so that all of the bound edges are aligned. This allows for the sorting machines to properly sort and prepare for delivery of the product.

By way of example, in most modern postal facilities, major steps have been taken toward mechanization (e.g., automation) by the development of a number of machines and technologies. These machines and technologies include, amongst others, letter sorters, facer-cancelers, automatic address readers, parcel sorters, advanced tray conveyors, flat sorters, letter mail coding and stamp-tagging techniques and the like. As a result of these developments, postal facilities have become quite automated over the years, considerably reducing overhead costs.

In use, these machines and technologies such as flats sorting machines (FSM) are capable of processing more than 10,000 flats per hour by electronically identifying and separating prebarcoded mail, handwritten letters, and machine-imprinted pieces. Computer-driven single-line optical character readers (OCR) are used in this process.

However, many of the machines currently in use including, for example, the FSM require that the mail or flats be oriented in a certain manner in order for the machines to properly sort the mail for delivery. In order to accomplish this task for flats, human intervention is required to complete the product sorting process, i.e., rearrange stacks of flats received from the publisher to align the bound edges, to permit automated feeding of the product. This manual operation is both time consuming and costly, thus increasing overhead and hence delivery rates.

SUMMARY OF THE INVENTION

In a first aspect of the invention, a mail edge biasing machine is provided for sorting stacks of products into a homogenous orientation. The machine includes a plurality of compartments and a plurality of moveable plates associated with each of the plurality of compartments. In embodiments, each of the plurality of moveable plates is adapted to support the stacks of products. A stationary feed head mechanism is positioned proximate a central compartment of the plurality of compartments. The feed head mechanism transports the products from the central compartment to remaining compartments such that the products transported to the remaining compartments are each stacked proximate the moveable plates and oriented with bound edges in the homogenous orientation.

In another aspect of the present invention, a mail edge biasing system includes a general holding container divided into three separate compartments and opposing moveable guide walls separating the three separate compartments. Moveable plates, associated with each of the three separate compartments, are adapted to move in either a first direction or a second direction. A feed head mechanism is positioned over a central compartment of the three separate compartments and includes (i) a movement mechanism for moving products positioned proximate a central moveable plate from the central compartment to opposing side compartments and (ii) an optical edge recognition system for recognizing differences in bound and non-bound edges of the products.

In still yet another aspect of the present invention, a method is provided for orienting a stack of products in a same direction. The method

includes the steps of providing a stack of products in a central compartment and incrementally moving the stack towards a feed head mechanism. A difference between a bound edge and a non bound edge of a top product is detected. The top product is elevated and transported to one of two side compartments based on the detecting step. All of the products transported to a first of the two side compartments are oriented in a first same direction and all products transported to a second of the two side compartments are oriented in a second same direction.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, aspects and advantages will be better understood from the following detailed description of a preferred embodiment of the invention with reference to the drawings, in which:

Figure 1 is a schematic diagram of the mail biasing machine of the present invention;

Figure 2 shows a belt drive system for moving stacks of products;

Figure 3 shows an alternative drive system for moving the stacks of product;

Figure 4 shows a bottom view of a feed head mechanism; and

Figure 5 is a flow diagram showing the steps of implementing the method of the present invention.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

The present invention is directed to a flat mail edge biasing machine used for separating stacks of bulk flats (products) into at least two stacks each with the bound edges of the products oriented in a same direction. This is accomplished by a system that includes (i) a feed head mechanism, (ii) an optical edge recognition system and (iii) adjustable stack guides or plates. In general, the optical edge detection system detects an orientation of the bound edge of the product (e.g., a difference in the roundness between bound vs. non bound edge of the product). This information is used to activate the feed head mechanism which, in turn, moves or slides the product in one of two directions in order to orient edges of the products in a homogenous manner, i.e., with all of the bound edges facing in a same direction. The plates are adapted to move the stacks of product toward and away from the feed head mechanism. In this manner, manual operations need not be performed on the stacks prior to mail sorting.

Flat Edge Biasing Machine of the Present Invention

Referring now to Figure 1, a schematic diagram of the flat edge biasing machine is shown. The flat edge biasing machine is depicted generally as reference numeral 100 and includes a general holding container 102 divided into three separate compartments, a central compartment 102a and opposing side compartments 102b and 102c. The

compartments 102a, 102b and 102c are separated by opposing moveable guide walls 104 positioned between the compartments 102a ,102b and 102a, 102c. In embodiments, the guide walls 104 are adjustable to accommodate different sized products, thus increasing the flexibility of the flat edge biasing machine of the present invention.

Moveable plates or paddles 106a, 106b and 106c are positioned within each of the compartments 102a, 102b and 102c, respectively. As shown by the arrows in Figure 1, the moveable plate 106a is moveable in a first direction and moveable plates 106b and 106c are moveable in a second direction. In a preferred embodiment, moveable plates 106b and 106c are movable in a direction opposite to that of the moveable plate 106a. The moveable plates 106a, 106b and 106c are moveable via belts or other mechanisms, discussed with reference to Figure 2.

Still referring to Figure 1, stacks of products 108a, 108b and 108c, respectively, are stacked on or positioned proximate to each of the moveable plates 106a, 106b and 106c. In particular, products stacked in a counter rotated manner (i.e., products with the bound edges rotated every so many pieces in order to maintain a straight stack) are stacked on or proximate to central plate 102a, where products oriented in a first homogenous orientation are stacked on or proximate to opposing side plate 108b and products stacked in a second homogenous orientation are stacked on opposing side plate 108c.

A feed head mechanism 110, preferably fixed or stationary, is positioned over the central compartment 102a, and more specifically over the central stack 108a. The feed head mechanism 110 includes a movement mechanism 112 (described with reference to Figure 4) and an optical edge recognition system 113. The movement mechanism 112 is

designed to move or slide the central stack of products 108a from the central compartment 102a to either of the side compartments 102b or 102c based on information received from the optical edge recognition system 113. A belt 118 is also provided for moving the product (discussed further with reference to Figure 4).

Figure 2 shows a belt drive system for moving both the respective stacks 108a, 108b and 108c as well as the moveable plates 106a, 106b and 106c. More specifically, belts 114a, 114b and 114c are adapted to move the stacks 108a, 108b and 108c in the respective directions (see arrows), i.e., belt 114a incrementally moves the stack 108a toward the feed head mechanism 110 and the belts 114b and 114c, on the other hand, incrementally move the stacks 108b and 108c, respectively, in a direction which is preferably in a second opposing direction. In embodiments, the incremental movement of belt 114a moves the stack 108a substantially in contact with or proximate to the feed head mechanism 110 in order to allow the feed head mechanism to move product from the central stack 108a to either the compartment 102b or 102c, depending on the location of the bound edge of the product. Additionally, the incremental movement of the belts 114b and 114c move the stacks 108b and 108c downward thereby allowing further product to be placed on the respective stacks. In a preferred embodiment, the respective stacks of product are positioned on the respective belts in order to better facilitate movement thereof.

Figure 3 shows an alternative drive system for moving both the stacks 108a, 108b and 108c as well as the moveable plates 106a, 106b and 106c. In particular, each of the moveable plates 106a, 106b and 106c are connected to a moveable piston/cylinder assembly 116a, 116b and 116c. This system is alternatively referred to as a bottom elevator type moving

system which allows the tops of the stacks to remain in a fixed plane (relative to the feed head mechanism) for ease of movement of a product from stack to stack. In this embodiment, the stacks should preferably be at approximately a 15° angle with respect to the vertical plane.

Figure 4 shows a bottom view of the feed head mechanism 110. The feed head mechanism 110 includes two separate vacuum chamber assemblies 112, each with multiple chambers and a belt 118, preferably perforated and coated with teflon® or other non-stick material. The vacuum chambers 112 are connected to a vacuum source 122 which provides a vacuum or suctioning to each of the suction ports 120, depending on the information received from the optical edge recognition system 113 (i.e., the orientation or position of a bound edge of the product). In operation, the vacuum source 122 provides a vacuum to the vacuum chamber 112 of one of the belts 118 which, in turn, then moves the product from the central stack 108a. The belt 118 is then activated so as to transport the product from the central stack 108a to one of the other stacks 108b and 108c. The suctioning can then be deactivated. The belts or other movement mechanism may then incrementally move the stacks, as discussed above.

Figure 5 is a flow diagram showing the steps of implementing the method of the present invention. The steps of the present invention may be implemented on computer program code in combination with the appropriate hardware. This computer program code may be stored on storage media such as a diskette, hard disk, CD-ROM, DVD-ROM or tape, as well as a memory storage device or collection of memory storage devices such as read-only memory (ROM) or random access memory

(RAM). Figure 5 may equally represent a high level block diagram of the system of the present invention, implementing the steps thereof.

In particular, in step 502, the optical edge recognition system 113 is activated. In step 504, a determination is made as to whether a first edge is rounder than a second edge of the product. If the first edge is rounder than the second edge, in step 506, the suctioning system for the first moving mechanism 112 is activated. In step 508, the product in the central stack 108a is elevated or suctioned. In step 510, the belt is activated and the product is transported from the central stack 108a to the side compartment 102b (or 102c). The central plate106a is then incrementally moved towards the feed head mechanism, in step 512, and the side plate 106a (or 106b) in which the product was positioned thereon is incrementally moved downward in step 514. In step 516, the suctioning mechanism 122 is deactivated. Note that the deactivation of the suctioning mechanism 122 may be performed at any time after step 510.

In step 518, a next determination is made as to whether there is any further product in the central compartment 102a. If not, then the system stops in step 520. However, if there is further product in the central compartment 102a, then the processes reverts back to step 504.

Now, in step 504, if the determination is made that the second edge is rounder than the first edge, in step 522, the suctioning system for the second moving mechanism 112 is activated. In step 524, the product in the central stack 108a is elevated or suctioned. In step 526, the belt is activated and the product is transported from the central stack to the other side compartment 102c (or 102b). The central plate 106a is then incrementally moved towards the feed head mechanism, in step 528, and the side plate 106b (or106a) in which the product was positioned thereon

is incrementally moved downward in step 530. In step 532, the suctioning mechanism 122 is deactivated. Again the deactivation of the suctioning mechanism 122 may be performed at any time after step 526. Steps 518 and 520 are then provided. In this manner, two stacks 108b and 108c are created that have bound edges in a homogenous orientation.

While the invention has been described in terms of preferred embodiments, those skilled in the art will recognize that the invention can be practiced with modification within the spirit and scope of the appended claims.